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DEVELOPMENT OF ELECTRONICS

IN

ETHIOPIA*

prepared by

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1. Background Information

Ethiopia is one of the developing countries of Africa with an area of about 1.2 million square kilometres and a population of some 42 million inhabitants. The economy is predominantly agrarian with the manufacturing sector contributing a mere 5 per cent to the GDP. Even though the agricultural sector is still considered as the base of the economy and hence accorded a paramount importance, the country has been endeavouring, especially since 1974, to import structural transformation in her economy and enhance the industrial sector. This is evident in the increasing contribution of the manufacturing sector in the past years, and in the fact that the industrial sector has been given the "leading role" in the country's recently drafted 10-year indicative plan.

Within the industrial sector particular emphasis is given to the development of engineering industries in which electronic industries form a good part.

Electronics is a high technology modern science and industry that has gone through dramatic changes and growth, especially in the post-war era, now encompassing practically the whole facet of modern living. It now influences modern economics both in the developing and developed worlds in the areas of defence, communication, broadcasting, public health, education, industry, business, atomic energy, entertainment, environmental control, space technology etc. The degree of influence in a particular area, however, varies with the general level of development of the country. In Ethiopia, for example, the country being in the lower ranks of development, electronics finds more applications in the areas of telecommunication, broadcasting and, to some extent, in entertainment, public health, defence and business areas. Production in the electronics sector has not yet started in Ethiopia, but it is time that such activities started at least by assembling imported kits and components to make such basic and broadly needed electronic items like radio, TV etc. The Government of Ethiopia has already realized this and serious considerations are currently being undertaken to survey the sub-sector and formulate such a project.

2. Status of the Electronic Sub-Sector

As indicated earlier, electronics has not yet started as an industrial activity in Ethiopia though some experimental trials towards assembling certain electronic equipment like radio etc. have been noted. The use of electronics, however, like in many other developing countries, started some 50 years back with the mass communication sub-sector, and one finds sophisticated systems in operation in the field of mass media (radio and TV), radio communication, telecommunication, navigational aids for civilization and data-processing.

2.1 Mass-Media

One of the earliest usages of electronics in Ethiopia was in radio broadcasting. Today broadcasts are made in three international and six national languages through studios in Addis Ababa, Asmara and Harar. The broadcasting transmitters range from 1-200 kw covering MW and SW bands. There are plans by the Government to modernize and expand not only the transmitting stations, but also increase the number of languages of transmissions so as to cover the entire population of the country.

Television transmission started in Ethiopia in the year 1964 with monochrome transmission in Addis Ababa, and today it has grown to cover a number of regional stations (Asmara, Diredawa, Jima etc.) connected through microwave links. Colour transmission has recently been introduced and there are ambitious plans to establish a number for transmitting stations along microwave routes, establish community receiving centres and expand present coverage by about 20 times. Ethiopia has an earth station capable of receiving international TV transmissions.

Radio and TV are now extensively used to transmit formal and non-formal education. In fact there is a unit, under the Ministry of Education, running some 11-1 kw transmitters scattered all around the country solely for this purpose.

2.2 Communications

Telecommunications were introduced to Ethiopia as early as the end of the 19th century. The manual and electro-mechanical exchanges yielding to electronics switching systems, telecommunication has become more and more electronics throughout the years. In Ethiopia, telecommunication has grown quite considerably, especially in the last 30 years, now employing some 113,000 auto and manual direct exchange lines, PBAXs, microwave links and a satellite earth station. The microwave links cover some 4,000 route kilometres. This includes the PANAFTEL link of the Shashemene/Moyale extension to Nairobi and the international surface link Assab/Djibouti. There are plans to expand the routes within the country (1,500 routes) to cover remaining important towns and also complete the PANAFTEL link with Gedariff (Sudan). The standard 'A' earth station accessing AOR primary satellite presently uses some sixty-one circuits out of which one only is an AVB data circuit and seven are record bearer circuits. The number of circuits in use is expected to rise to 1,112 in the next five years. There are also plans to set up a standard 'B' earth station accessing IOR traffic and also to introduce digital switching.

Radio communication is widely applied for more specialized (localized) communication purposes. This covers products like HF, VHF and UHF transreceivers, fixed as well as mobile and hand-held. They are finding increasing use in police and security services, airport, state farms, mining, construction activities etc. Radio communication contributes greatly, especially in developing countries like Ethiopia where there is a lack of adequately developed roads and other line communication facilities.

2.3 Industrial applications

Industrial establishments in Ethiopia, mostly being old and technologically backward, make little use of electronics applications. In the industrialized countries, the industrial sector is experiencing practically a revolution through the applications of power electronics and microelectronics in the instrumentation, control and management, automation and robotization of huge industrial enterprises. Ethiopia has yet a lot to do to benefit from this area.

2.4 Business Application, Computing and Data Processing

This is an area in which microelectronics finds great application, not only in the developed countries but also in developing countries like Ethiopia. Electronic calculators and cash registers have practically replaced the obsolete slide rule and mechanical calculators. Mini- and large-frame computers are finding wider application in business organizations, banks, hotels, engineering organizations and universities. They are mostly used in computing recording, posting, billing, pay-roll and inventory control. Applications in other areas of management are also being introduced. The Ethiopian Airlines, for example, makes use of modern computers in ticketing, programming, maintenance management, airport management etc.

3. Market and Demand for Electronics Products

One can see from the above indications that, despite the low level of economic development, Ethiopia makes use of a wide range of electronic products in her endeavour to modernize her economy, enhance the standard of living of the people and keep pace with the fast changing but intricately interdependent modern world. A substantial amount of yearly expenditure is spent to import electronic product. This can be seen from Table 1 showing the import figures of electronic products for the years 1977-1980. The decreasing total annual value of the imports does not show a decrease in the actual demand for electronic products. This happened due to the political and economic complications following 1974 and the recurrent shortages in foreign exchange vis-a-vis the country's endeavour to allocate her meagre resources to more basic and necessary commodities.

Although the demand for a particular electronic product is still generally too low to justify local production, it is sure to rise with the economic development of the country and the standard of living of the population. A recent demand projection for selected consumer electronic items shown in Table 2 could serve as a conservative indication of this trend.

Electronic products cover a wide variety and are fast changing. It is obvious that no developing country can satisfy its yearly demand purely by importing. An in-house capability for production has to be started somehow and encouraged so as to gradually compensate for more and more of the import requirements.

4. The Electronic Industry - Techno-Economic Characteristics

It has been repeatedly pointed out that the electronic industry is characterized by fast changes and a high rate of obsolescence, both in the production and application areas. It has changed in less than half a century from vacuum tubes to transistors and finally to microelectronics whose technological sophistication, miniaturization and field of application is increasing at astounding rates. This characteristic of the industry might make it difficult for developing countries like Ethiopia to start their own industry.

The electronic industry has, however, other characteristics, which make it particularly interesting from the point of view of developing countries: high growth rate/growing market; impact on every sector of the economy; increase of productivity in industries; elasticity in its employment levels; location independent; export oriented; use of products is already introduced; high intersectoral linkages; high flexibility of production facilities.

The above characteristics of the electronic industry, its relatively low capital intensity requirement and higher output to capital ratios make it attractive and useful for developing countries like Ethiopia to start and develop their own electronic industry as early as possible. The question is now to what extent and how.

5. Development Policies and Strategies

Many electronic products are highly sophisticated and are required in relatively smaller quantities especially in developing countries. Their production, on the other hand, is more capital intensive and technology

intensive. Hence even the more developed countries still depend on other highly industrialized countries for the supply, installation and even maintenance of this sophisticated equipment. On the other hand, there are quite a number of electronic products required in large numbers and for mass consumption, like radio, TV receivers, telephone apparatus, calculators etc., which are relatively simple in construction. Developing countries usually start industrial activities in the electronic sub-sector with assembly of such products. With growing competence, the forward integration of component production and development of new design continue.

Various strategies might be pursued for the development of electronic industries in developing countries as far as the market and technological transfer requirements are concerned. In many African countries, the market even for consumer electronics is limited because of low per capita income rather than size of population. But this problem could be solved if the market capacities of individual countries could be pooled. Some developing countries have preferred the domestic market-oriented strategy which is characterized by a very low rate of growth but stronger inter and intra-sectoral linkages resulting with more self-reliant development.

Another important factor that should be considered, when setting strategies of development of the electronic industry in a developing country like Ethiopia, is the level of technology one should start with and the manner of its transfer and acquisition. In the fast-changing electronic industry direct component technology which was widely used just a decade ago, is being replaced with the high technology semiconductor technology that has proved to be cheaper and technically more dependable. Semiconductor technology has greatly reduced the number of components that go into electronic equipment and thus has made their assembly easier. But component production and design developments require high technological capabilities.

Technological transfer to developing countries can be made, at least in the beginning, through foreign investment, joint ventures and licensing arrangements until local competence, design and R and D capabilities are built up.

Considering the above, Ethiopia is presently designing an optimal strategy suitable to local conditions for the obvious aim of building up a self-reliant, fast-growing and successful electronic industry.

6. Conclusions and Recommendations

The case of the Ethiopian electronic scene, roughly outlined in the preceding sections illustrates the important role that electronics play even in developing economies. Like it or not, any country cannot do without increasing applications of electronics in this modern interdependent world. Modern development requires wider and wider applications of electronics, especially in the areas of manufacturing, communication and management.

Hence, developing countries should give priority to this important and dynamic sub-sector, enhance its usage, assess their requirements, devise proper policies and strategies and pursue a self-reliant development of the sub-sector.

The ever-developing micro-electronics increases productivity, raises efficiency, improves quality, enhances education and, in general, makes life easier. All developing countries should exploit this to their utmost capabilities.

Table 1 - Import of electronic products into Ethiopia: 1977-1980

	SITC No.	Product	Value in Birr			
			1977	1978	1979	1980
1.	751.210	Calculating machine	1,086,772	561,445	253,981	542,377
2.	751.230	Cash register	41,420	35,065	43,669	17,110
3.	751.220	Accounting machine	268,192	421,960	17,744	110,516
4.	752.000	Automatic data processing	832,342	678,765	905,834	468,119
5.	761.110	TV broadcast receiver	717,640	88,543	80,814	927,028
6.	762.110	Radio receiver	4,708,832	2,160,058	1,564,107	2,090,588
7.	762.111	Other radio receiver including radiograms and cassete	2,920,817	1,515,580	358,988	686,641
8.	763.110	Gramophones	184,165	11,250	9,903	52,009
9.	763.180	Record player tape and deck	1,754,940	542,936	149,343	469,227
10.	763,800	Other sound recorders and reproducers	244,840	48,803	59,838	59,716
11.	764.110 and 764.310	Electric line telephone and telegraphic apparatus, microphones and loudspeakers, radio broadcasting apparatus, television transmission apparatus	5,207,937	12,479,871	1,552,842	2,562,112
12.	764.820	Other television video cameras	11,795	300	9,375	6,475
13.	764.831	Radio navigational aid apparatus	2,212,929	2,562,104	66,650	206,576
14.	764.832	Other radio navigational apparatus, radar, etc.	11,538	56,818	39,905	9,120

(cont'd)

Table 1 (cont'd)

	SITC No.		Value in Birr 1977	1978	1979	1980
15.	764.910	Parts n.e.s.falling within heading 764.110	16,081,935	11,507,118	10,174,456	6,959,640
16.	764,920	Parts n.e.s. of the appartus falling within heading 764.210	35,085	113,066	521,208	148,036
17.	764.931	Radio spare parts	540,837	1,387,853	6,017,044	3,319,127
18.	764.990	Parts n.e.s. of the apparatus and equipment falling with 763.	2,350,559	956,332	1,826,434	204,384
19.	776,000	Radio values,tubes and transistors	8,488	2,499	56,319	52,582
		Total Imports	39,221,063	35,130,366	23,708,534	18,891,383

Table 2 - **Demand for Selected Consumer Electronics Products**

Selected Electronic Products	1984 Population (PCs)	Annual Demark in Pcs		
		1985	1990	1994
1. Radio Sets	1,600,000	20,000	172,275	230,068
2. Tape-recorders		18,000	25,841	34,510
3. Television	45,000	9,000	22,395	46,438
4. Telephone sets	107,385	8,913	14,381	19,784